Name:_____ Date:_____
Calculus Quarter 3 Test 2 Review Mr. Callahan

This review is not comprehensive. Be sure to study your notes and homework assignments as well!

1. A railroad track and a road cross at right angles. An observer stands on the road 70 meters south of the crossing and watches an eastbound train traveling at 60 meters per second. At how many meters per second is the train moving away from the observer 4 seconds after it passes through the intersection?

(A) 57.60 (B) 57.88 (C) 59.20 (D) 60.00 (E) 67.40

2. If the derivative of f is given by $f'(x) = e^x - 3x^2$, at which of the following values of x does f have a relative maximum value? Derivative goes from (+) to (-)

(A) –0.46 (B) 0.20 (C) 0.91 (D) 0.95 (E) 3.73

3. Let f be the function given by $f(x) = 2e^{4x^2}$. For what value of x is the slope of the line tangent to the graph of f at $(x, f(x))$ equal to 3 ? derivative = 3

(A) 0.168 (B) 0.276 (C) 0.318 (D) 0.342 (E) 0.551

4. The function f has first derivative given by $f'(x) = \frac{\sqrt{x}}{1 + x + x^3}$. What is the x-coordinate of the inflection point of the graph of f ? f'' changes sign

(A) 1.008 (B) 0.473 (C) 0 (D) –0.278 (E) The graph of f has no inflection point.

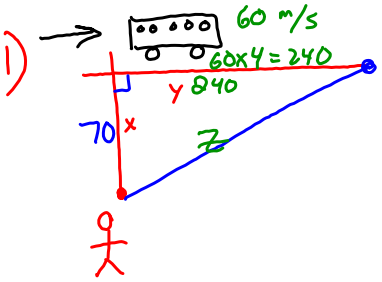
5. A Stone thrown into a pond produces a circular ripple which expands from the point of impact. If the radius of the ripple increases at the rate of 1.5m/sec, how fast is the disturbed area growing when the radius is 8m?

6. A large spherical balloon is being inflated with helium at a rate of 10 m^3/sec. At the instant when the balloon contains 972π m^3 of helium, how fast is its radius increasing? How fast is the surface area changing at that instant?

7. A 10ft ladder is leaning against a wall. The foot of the ladder is sliding away from the wall at 2ft/sec. How fast is the top of the ladder sliding down the wall when the foot of the ladder is 6 feet from the wall?

8. A can is being filled with water at a rate of 50cm^3/min. The radius of the can is 10cm. How fast does the height of the water in the can rise?

1)



$70^2 + 240^2 = z^2$
$4900 + 57600 = z^2$
$62500 = z^2$
$250 = z$

$x = 70$ $\frac{dx}{dt} = 0$ (person isn't moving)
$y = 240$ $\frac{dy}{dt} = 60$
$z = 250$ $\frac{dz}{dt} =$

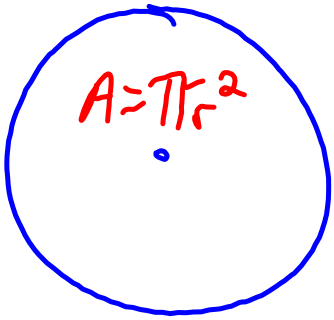
$x^2 + y^2 = z^2$
$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2z\frac{dz}{dt}$
$2(70)(0) + 2(240)(60) = 2(250)\frac{dz}{dt}$
$0 + 28800 = 500\frac{dz}{dt}$
$\frac{28800}{500} = \frac{500\frac{dz}{dt}}{500}$
$57.6 = \frac{dz}{dt}$

57.6 m/sec

5) $\frac{dr}{dt} = 1.5$

$r = 8$

Want: $\frac{dA}{dt}$



$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$$

$$\frac{dA}{dt} = 2\pi(8)(1.5)$$

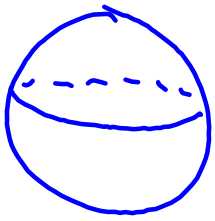
$$\frac{dA}{dt} = 24\pi \ m^2/sec$$

Area grows @ $24\pi \ m^2/sec$

a) $\frac{dV}{dt} = 10$

$V = 972\pi$

$V = \frac{4}{3}\pi r^3$



Use volume to find r.

$\frac{972\pi}{4/3} = \frac{\frac{4}{3}\pi r^3}{4/3}$

$729 = r^3$

$9 = r$

$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$

$10 = 4\pi(9)^2 \frac{dr}{dt}$

$10 = 324\pi \frac{dr}{dt}$

$\frac{10}{324\pi} = \frac{dr}{dt}$

radius changing @ $\frac{10}{324\pi}$ m/sec

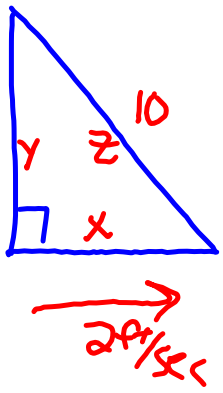
b) $S = 4\pi r^2$

$\frac{dS}{dt} = 8\pi r \frac{dr}{dt}$

$\frac{dS}{dt} = 8\pi(9)\left(\frac{10}{324\pi}\right)$

$\frac{dS}{dt} = \frac{720}{324} = \frac{20}{9}$ m²/sec

⊛7)



$x = 6$ $\quad \frac{dx}{dt} = 2$

$y = 8$ $\quad \frac{dy}{dt} =$

$z = 10$ $\quad \frac{dz}{dt} = 0$

$x^2 + y^2 = z^2$

$6^2 + y^2 = 10^2$

$36 + y^2 = 100$

$y^2 = 64$

$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 2z\frac{dz}{dt}$

$2(6)(2) + 2(8)\frac{dy}{dt} = 2(10)(0)$

$24 + 16\frac{dy}{dt} = 0$

$16\frac{dy}{dt} = -24$

$\frac{dy}{dt} = \frac{-24}{16} = -1.5$ ft/sec

ladder sliding down @ 1.5 ft/sec

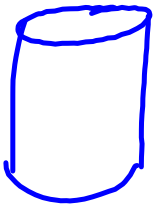
8) $\frac{dV}{dt} = 50$

$r = 10$

$V = \pi r^2 h$

$V = \pi (10)^2 h$

$V = 100\pi h$



$\frac{dV}{dt} = 100\pi \frac{dh}{dt}$

$50 = 100\pi \frac{dh}{dt}$

$\frac{50}{100\pi} = \frac{dh}{dt}$

$\frac{1}{2\pi}$ cm/min